CLAIMS

1. Apparatus for transmitting an OFDM signal, said apparatus comprising:

a transform block that converts a group of subcarriers of an OFDM symbol to a set of time domain samples of said OFDM symbol; and

a frequency domain mapping block that assigns modulated subcarriers of said group to subchannels of said OFDM symbol so that said transform block outputs a time domain digital signal positioned at an IF.

2. The apparatus of claim 1 wherein said frequency domain mapping block adjusts values of said subcarriers so that said samples of said time domain digital signal have strictly real values.

3. The apparatus of claim 1 further comprising a cyclic prefix block that adds a cyclic prefix to said time domain burst.

4. The apparatus of claim 3 further comprising:

a digital to analog converter that generates an analog signal derived from output of said transform block without time domain digital filtering.

5. Apparatus for receiving an OFDM signal, said apparatus comprising:

a transform block that converts received time domain samples to a frequency domain OFDM symbol; and

a frequency domain symbol processing block that selects subcarriers of said frequency domain OFDM symbol centered at an IF as baseband frequency domain symbols thereby frequency shifting said selected subcarriers to baseband.

6. The apparatus of claim 5 wherein said time domain samples have strictly real values and values of input and/or output of said transform block are processed so that a transform length used by said transform block is reduced.

7. The apparatus of claim 5 further comprising:

an analog to digital converter that converts an IF analog signal to provide said time domain samples without time domain digital filtering.

8. The apparatus of claim 5 wherein said analog to digital converter over samples said analog signal.

9. A method for transmitting an OFDM signal, said method comprising:

assigning subcarriers to subchannels centered around an IF within an OFDM frequency domain symbol to implement a frequency shift to that IF;

converting said frequency domain OFDM symbol to time domain samples; and

transmitting a signal based on said time domain samples.

10. The method of claim 9 further comprising:

generating an analog signal based on said time domain samples without time domain digital filtering.

11. A method of using an N/2-point transform to transform a N-point complex-valued series to an N-point real-valued series, said method comprising:

mapping said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

performing an inverse Fourier transform on said first N/2-point complex-valued series to obtain a second N/2-point complex-valued series; and

mapping real and imaginary components of said second N/2-point complex-valued series to said N-point real-valued series using a second mapping function.

12. The method of claim 11 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$
$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$
$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$
$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein $A + B = N$, $R(m)$ is a real component of an mth point of said first N/2-point complex-valued series, $I(m)$ is an imaginary component of said mth point; $X_r(p)$ is a real component of a pth point of said N point complex-valued series, and $X_i(p)$ is an imaginary component of said pth point.

13. The method of claim 11 wherein said second mapping function comprises:

$x(2k) = y_r(k)$, $x(2k+1) = y_i(k)$ wherein $x(p)$ is a real-only value of a pth component of said N-point real-valued series, $y_r(k)$ is a real component of a kth complex point of said second N/2 complex-valued series, and $y_i(k)$ is an imaginary component of said kth complex point.

14. A method for receiving an OFDM signal, said method comprising:

converting time domain samples to a frequency domain symbol using a transform; and

selecting subcarriers from said frequency domain symbol to effect a frequency shift from an IF to baseband.

15. The method of claim 14 wherein said time domain samples have strictly real values and said method further comprises:

processing said time domain samples prior to converting and processing said frequency domain OFDM symbol after converting to reduce a needed transform length of said transform.

16. The method of claim 14 further comprising:

converting an IF analog signal to a digital signal used to generate said time domain samples without time domain digital filtering.

17. The method of claim 15 wherein converting comprises oversampling said IF analog signal.

18. Apparatus for transmitting an OFDM signal, said apparatus comprising:

means for assigning subcarriers to subchannels centered around an IF within an OFDM frequency domain symbol to implement a frequency shift to that IF;

means for converting said frequency domain OFDM symbol to time domain samples; and

means for transmitting a signal based on said time domain samples.

19. Apparatus for receiving an OFDM signal, said apparatus comprising:

means for converting time domain samples to a frequency domain OFDM symbol using a transform; and

means for selecting subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an IF to baseband.

20. A computer program product for transmitting an OFDM signal, said computer program product comprising:

code that assigns subcarriers to subchannels centered around an IF within a frequency domain OFDM symbol to implement a frequency shift to that IF;

code that converts said frequency domain OFDM symbol to time domain samples;

code that transmits a signal based on said time domain samples; and

a computer-readable storage medium that stores the codes.

21. The computer program product of claim 21 further comprising:

code that adjusts values of said frequency domain OFDM symbol so that said time domain samples have strictly real values and a needed transform length used in converting is reduced.

22. A computer program product for using an N/2-point to transform N-point complex-valued series to an N-point real-valued series, said computer product comprising:

code that maps said N-point complex-valued series to a first N/2-point complex-valued series using a first mapping function;

code that performs an inverse Fourier transform on said first N/2-point complex-valued series to obtain a second N/2 complex-valued series;

code that maps real and imaginary components of said second N/2-point complex-valued series to the N-point real-valued series using a second mapping function; and

a computer readable storage medium that stores the codes.

23. The computer program product of claim 22 wherein said first mapping function comprises:

$$R(A) = [X_r(A) - X_r(B)] * \sin A + [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$
$$R(B) = [X_r(B) - X_r(A)] * \sin A - [X_i(A) + X_i(B)] * \cos A - X_r(A) - X_r(B)$$
$$I(A) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A - X_i(A) + X_i(B)$$
$$I(B) = [X_i(B) + X_i(A)] * \sin A + [X_r(B) - X_r(A)] * \cos A + X_i(A) - X_i(B)$$

wherein $A + B = N$, $R(m)$ is a real component of an mth point of said first N/2-point complex-valued series, $I(m)$ is an imaginary component of said mth point; $X_r(p)$ is a real component of a pth point of said N point complex-valued series, and $X_i(p)$ is an imaginary component of said pth point.

24. A computer program product for receiving an OFDM signal, said computer program product comprising:

code that converts time domain samples to a frequency domain OFDM symbol using a transform;

code that selects subcarriers from said frequency domain OFDM symbol to effect a frequency shift from an IF to baseband; and

a computer-readable storage medium that stores the code.

25. The computer program product of claim 24 wherein said time domain samples have strictly real values and said computer program product further comprises:

code that processes said time domain samples prior to operation of said converting code and processes the frequency domain OFDM symbol after operation of said converting code to reduce a needed transform length of said transform.